



DMSO

HLA Rules Update

January 1996



Status of HLA Rules

- **Draft write-up prepared for AMG-8**
- **AMG-8 discussion of rules**
 - **General agreement on intent and content of rules**
 - **Major questions on extent of application - policy**
 - **definition of compliance for all simulations**
 - **impact on legacy simulations**
- **AMG-9**
 - **Rule briefing has been revised based on AMG-8 discussions and feedback**
 - **clarification of ambiguities**
 - **restatement to focus policy issues for direct discussion**
 - **Review revised rule statements**
 - **Discuss policy issues**
 - **How much of a simulation's representation must be included in a SOM?**
 - **How will these rules apply to legacy simulations (including simulations now being planned or developed)?**



Purpose

- **Review the HLA rules as incorporated in the initial HLA definition and updated based on AMG-8 discussion**
 - **description**
 - **rationale**
 - **pros and cons**
 - **overall assessment**
- **Revise rule set as appropriate**
- **Discuss key policy issues and options**



Rules

- 1 Federations must have an HLA Federation Object Model (FOM) using the HLA OMT.**
- 2 All Federates must have an HLA Simulation Object Model (SOM) using the HLA OMT.**
- 3 All object representation occurs in the Federates, not in the RTI.**
- 4 Data exchange among objects represented across federates occurs via the RTI.**
- 5 Federates must interact with the Runtime Infrastructure (RTI) in accordance with the HLA Interface Specification.**
- 6 An attribute of an object can be owned by one and only one federate at any given time.**
- 7 Federates must be able to export any attributes of objects in their SOM and exercise any SOM object interaction externally.**
- 8 A federate must be able to either own or reflect any object or attribute in its SOM and to transfer/accept ownership of any of these objects/attributes dynamically during a federation execution.**
- 9 Federates must be able to vary the conditions under which they provide updates of public attributes of objects.**
- 10 Federates must be able to support data exchange in accordance with federation requirements.**



Rule 1

- Description:** Federations must have an HLA Federation Object Model (FOM), documented using the HLA OMT.
- Rationale:** Formalization of the agreement on information exchange requirements across a federation provides an effective mechanism for documentation to support interoperability and reuse and for runtime initialization.
- Pros:** FOM information is needed with or without this rule; a prescribed format provides general guidance and a cost-effective reuse mechanism.
- Cons:** Perceived cost of preparing FOM is borne by federation developer with reuse benefits to other future users.
- Assessment:** Rule is important and is worth the limited cost; federation developer benefits from the guidance inherent in common, formalized FOM development, and from the availability of automated tools.



Rule 2

- Description:** All Federates must have an HLA Simulation Object Model (SOM), documented using the HLA OMT.
- Rationale:** Reuse is key objective of the HLA; SOMs provide the means for documentation of available functionality in existing federates for reuse in federations, and are tools for federation development.
- Pros:** Provides common accessible information to promote reuse and thus reduce costs
- Cons:** Perceived cost to simulation developers to create SOMs; more information than is currently in the OMT will be needed to make full decision about applicability of a federation for a particular application
- Assessment:** This rule is important and is worth the cost; recommend SOM be supported by links to more detailed federate data; extensions to SOM will be made based on experience. Automated tools are also possible.



Rule 3

- Description:** All object attribute representation (ownership) occurs in the Federates, not in the RTI.
- Rationale:** The RTI is intended to be application-independent. As such, it should be divorced from any specific object representation, which is the purview of the developers of the federates, whose primary function is supporting user operational requirements. In addition, separating simulation functionality from supporting services cost-effectively ensures federations have consistent common support.
- Pros:** Cost-effective way to provide common functionality while allowing simulation developers to concentrate on the real heart of their task.
- Cons:** Constrains federates to use specified services (may be viewed as a con to certain developers).
- Assessment:** Rule is essential.



Rule 4

- Description:** Data exchange among objects represented across federates occurs via the RTI
- Rationale:** Coordinated exchange of data among federates is critical to a coherent federation; the RTI provides the services needed for this coordination
- Pros:** Common services to provide needed coordination among federates in exchange of data about public objects, attributes, and interactions (FOM) is a necessary prerequisite to coherent distributed applications using the HLA.
- Cons:** Restricts developers, has performance costs over direct data exchange.
- Assessment:** Rule is key and should be incorporated; rule does not restrict distributed software within federates, only exchange among federates on shared (public) objects, attributes, and interactions. This may include state changes, interactions, and similar data.



Rule 5

- Description:** Federates must interact with the Runtime Infrastructure (RTI) in accordance with the HLA Interface Specification, as represented in the IDL API.
- Rationale:** A standard set of interfaces between federates and the RTI services ensures that simulations are able to be reused in different federations and across different implementations of the RTI
- Pros:** Allows HLA to support broad spectrum of users, supports parallel development (technology insertion) of federates and RTI
- Cons:** Functional interface standard is insufficient, API should be standardized, with option that other APIs might be added in the future.
- Assessment:** Rule is critical; extended to API.



Rule 6

- Description:** An attribute of an object can be owned by one and only one federate at any given time.
- Rationale:** Consistent data ownership is key to coherent federations
- Pros:** Unless it supports data consistency, HLA will not be a useful capability
- Cons:** Requires the RTI be able to handle unambiguous object attribute transfer (e.g. orphaned attribute issue)
- Assessment:** This rule is critical



Rule 7

- Description:** Federates must be able to publish values of any attributes of objects in their SOM* and exercise any SOM object interaction externally.
- Rationale:** To participate in a federation, federates will need to publish values of attributes of the objects it computes internally (so they can be used by other federates) and export interactions it generates internally (so its objects can interact with objects in other federates). Different FOMs may incorporate different object/attributes.
- Pros:** Building in this capability into a federate allows for reuse with different federations. Data will only be published if FOM calls for it and others subscribe to it.
- Cons:** There is a cost (dollars and performance, TBD) to building in this capability. May be difficult to test.
- Assessment:** Rule is important and should be included. Most new simulations have broad sets of requirements which this rule supports

* Requires some clearer statement of what a SOM must include (policy issue).



Rule 8

- Description:** A federate must be able to either own or reflect instances of any object or attribute in its SOM* and to transfer/accept ownership of any of these objects/attributes dynamically during a federation execution.
- Rationale:** This capability is necessary to enable a simulation built for one purpose to be able to be reused in a federation
- Pros:** Supports reuse of federate in different federations. Whether a federate owns or reflects an attribute will depend on rqts of a federation
- Cons:** There is a cost to building this capability into a simulation (TBD)
- Assessment:** Rule is important and should be included. Most new simulations have broad sets of requirements which this rule supports

* Requires some clearer statement of what a SOM must include (policy issue).



Rule 9

- Description:** Federates must be able to vary the conditions under which they provide updates of public attributes of objects.
- Rationale:** Different federations will specify different attribute update conditions; this rule equips federations to be able to support a wider range of federation . May also be useful to do communications congestion management (a network or federate load processing issue).
- Pros:** Supports reuse.
- Cons:** Unless state updates within the simulation are changed (can be intrusive to the simulation) this rule is of limited use.
- Assessment:** Need for flexibility and adaptability in federates is important to their effective reuse. OMT should be extended to document the range of attribute update methods supported by a federate.



Rule 10

- Description:** Federates must be able to support data exchange in accordance with HLA time management services.
- Rationale:** Different federations will specify different attribute update conditions; this rule equips federations to be able to support a wider range of federation .
- Pros:** Supports reuse; essential for synchronized federation operations.
- Cons:** Could pose costs to federate development.
- Assessment:** HLA time management provides a range of methods usable across the spectrum of federate time management schemes.



Policy Discussion

- **Should all rules apply to all simulations?**
- **What should a SOM include (Rule 1)?**
 - **For new simulations?**
 - **For legacy simulations?**